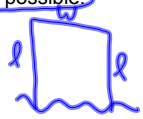
L11(3.2 & 3.3) Applications of Quadratics in Factored Form

1. A rectangular lot is bounded on one side by a river and on the other three sides by 80m of fencing. Determine the dimensions of the largest lot possible.

① $\ell w = A$

② $2\ell + w = 80$



Rearrange ②

$w = 80 - 2\ell$

Sub ② into ①

$A = \ell(80 - 2\ell)$

$0 = \ell(80 - 2\ell)$

$\ell = 0$ or $80 - 2\ell = 0$

$\frac{80}{2} = \frac{2\ell}{2}$

$\ell = 40$

AOS: $\frac{0+40}{2}$

$\ell = 20$

Sub $\ell = 20$ into ②

$w = 80 - 2\ell$

$= 80 - 2(20)$

$= 80 - 40$

$w = 40$

∴ the dimension that gives us the max lot are $w = 40_m$ & $\ell = 20_m$

2. Supermarket cashiers try to memorize current sale prices while they work. A study showed that, on average, the percent, P, of prices memorized after t hours is given approximately by the formula

$P = -40t^2 + 120t$

What is the greatest percent of prices memorized, and how long does it take to memorize them?

$P = -40t^2 + 120t$

$= -40t(t - 3)$

$-40t = 0$ or $t - 3 = 0$

$t = 0$ $t = 3$

AOS: $\frac{0+3}{2}$

$t = 1.5$

Sub $t = 1.5$

$P = -40(1.5)^2 + 120(1.5$

$= 90$

∴ it 1.5 hour to memorize 90% of the sale prices.

3. The cost of a ticket to a hockey arena is $3, and the arena holds 800 people. At this price, every ticket is sold. A survey indicates that for every dollar increase in price, attendance will fall by 100 people.
(a) What ticket price results in the greatest revenue?
(b) What is the greatest revenue?

$R = (\#\text{sold})(\text{ticket price})$

$0 = (800 - 100x)(3 + x)$

$800 - 100x = 0$ or $3 + x = 0$

$\frac{800}{100} = \frac{100x}{100}$ $x = -3$

$x = 8$

Ans: $\frac{8 - 3}{2}$

$x = 2.5$

∴ a ticket price of $5.50 will result in a max revenue of $325.

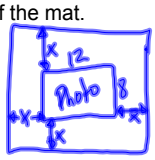
Sub $x = 2.5$ to solve R

$R = (800 - 100x)(3 + x)$

$= (800 - 100(2.5))(3 + 2.5)$

$= 325.$

4. A photograph measuring 12 cm by 8 cm is to be surrounded by a mat before framing. The width of the mat is to be the same on all sides of the photograph. The area of the mat is to equal the area of the photograph. Find the width of the mat.



$(2x + 8)(2x + 12) = 192$

$4x^2 + 24x + 16x + 96 = 192$

$4x^2 + 40x + 96 - 192 = 0$

$4x^2 + 40x - 96 = 0$

$4(x^2 + 10x - 24) = 0$

$4(x - 2)(x + 12) = 0$

$x - 2 = 0$ $x + 12 = 0$

$x = 2$ $x = -12$ Reject measurement must be positive

∴ the width of the mat is 2cm.

$A = 12 \times 8 = 96$

$A_{total} = 96 + 96 = 192$

Many word problems dealing with quadratic relations in factored form are concerned with financial situations (i.e., money). You may find the following definitions useful:

Revenue: The income for the business; the amount of money that comes into the business; positive. R = (#sold)(price)

Cost: The expenses for the business; the amount of money that goes out of the business; negative.

Profit: The difference between *revenue* and *cost*.
Profit = Revenue – Cost.
A positive profit is good for a business, and a negative profit (also called a *loss*) is bad.

Break-Even Point : The point where profit is zero. This is where profit changes between positive and negative.

Assigned Work:

p. 147 # 12, 13, 14
p. 157 # 13, 14, 15

Unit Test

Suggested Review:

- read through all notes
- revisit homework questions
- redo questions that caused problems

Also Review Handout